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09/765,044	01/19/2001	Chyi-Tsong Ni	TS00-355	6921

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EXAMINER

BREWSTER, WILLIAM M

ART UNIT PAPER NUMBER

2823

DATE MAILED: 06/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/765,044

Applicant(s)

NI ET AL.

Examiner

William M. Brewster

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 8-11, 17-20, 26-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perng et al., U.S. Patent No. 6,149,987 in view of Ngo, U.S. Patent No. 6,054,735.

Perng teaches placing a semiconductor wafer on the wafer chuck/heater within the CVD chamber; in fig. 3, the semiconductor wafer 306 including an upper second PECVD silicon oxide film 302, with TEOS, which may coat the inner walls, of thickness of from about 100 Å to about 2000 Å thick, col. 10, line 50 - col. 11, line 8, preheating the chamber to about 400° C, col. 11, lines 9 - 37, having a second thermal CVD oxide deposition rate, and depositing a porous silicon oxide film 312 upon the upper second PECVD silicon oxide film overlying the semiconductor wafer, thickness of less than about 10,000 Å, col. 10, lines 26 - 39, at a temperature of about 300° C - 480° C, with a lesser deposition rate, col. 11, lines 38 - 64; the porous silicon oxide film being different from the first PECVD silicon oxide film coating the CVD chamber inner walls. Although Perng does not explicitly state that the porous silicon oxide film is formed on

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the walls, the deposition is not very discriminating and will deposit porous oxide on the sidewalls.

Perng does not teach a precoat step, but Ngo does. Ngo teaches a method, in fig. 3, of pre-coating 302 at least a portion of the CVD chamber inner walls with a layer of first PECVD silicon oxide film having a first thermal CVD oxide deposition rate thereupon, col. 2, lines 36 – 52, then deposits a second layer of PECVD oxide, col. 3, lines 4 - 10. As Ngo does not specify the deposition rate for the pre-coating step, the user may use a slower deposition for the second PECVD oxide than the first PECVD oxide. Ngo gives motivation in col. 1, lines 31-33. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Ngo's process with Perng's invention would have been beneficial because it facilitates producing a high quality, uniform and very thin PECVD oxide layer.

Claims 3 -7, 12-16, 21-25, 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perng in view of Ngo as applied to claims 1, 2, 8-11, 17-20, 26-31 above, and further in view of Tao, U.S. Patent No. 5,904,566.

Neither Perng nor Ngo teach using TEOS in the porous oxide, but Tao does. Tao teaches in fig. 2, forming a semiconductor substrate 30, and forming an oxide layer 42 with  $O_3$  at about 300-500° C, using  $SiH_4$ , col. 7, lines 51–63, with flow rate of from about 4000 to about 6000 sccm, and TEOS with a concentration of about 200 to about 400 mg/cm<sup>3</sup> in a carrier gas flow rate from about 2000 to about 3000 sccm, col. 7, line 64 - col. 8, line 41. Tao gives motivation in col. 2, lines 13-56. It would have been

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obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Tao's process with Perng and Ngo's invention would have been beneficial because it aids in forming vias through the oxide layers that have flat, instead of rounded bottoms.

Although Perng, Ngo, and Tao do not specifically state the porous silicon oxide would deposit faster upon the first PECVD silicon oxide film than on the upper second PECVD silicon oxide film, but it embodies this physical parameters because Ngo forms the first PECVD oxide with  $\text{SiH}_4$ , col. 2, lines 10-52, and forming the second PECVD film with  $\text{O}_3$  and TEOS, col. 8, lines 26-41. As the two oxides are formed differently as claimed by the application, they would also display the feature of the porous oxide film depositing faster on the first PECVD than the second PECVD.

The thickness of the first chamber covering oxide, the deposition rates of the oxide depositions, the flow rate of the TEOS or the time, and the density of the porous oxide, may be optimized.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances,

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however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art . . . such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality . . . More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ 233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

### ***Response to Arguments***

Applicant's arguments received 21 April 2003 have been fully considered but they are not persuasive. Applicants argue that no one reference teaches forming: 1) the pre-coating first PECVD oxide, 2) an upper second PECVD oxide, 3) depositing a porous silicon oxide film upon the upper second PECVD oxide, and 4) the second PECVD is deposited at a lesser rate than the first PECVD oxide.

Examiner does not find the argument convincing. Examiner concedes that no one reference teaches the entire claimed invention, but does maintain the §103(a) rejection. Ngo (735) teaches steps 1) & 2) and Perng teaches steps 2) & 3). As for step 4) Ngo (735) does not give firm numbers for the deposition rate of the pre-coating step leaving the rate to be optimized by the user. Furthermore, due variation in the process tools, the composition of the layer a second deposition step was coated upon,

or the variation of reactants, a recipe calling for similar coating steps may yield different deposition rates. Ngo's first pre-coating oxide covering the inner walls of the chamber is a distinctly different oxide layer from Perng's porous oxide layer formed on top of the second PECVD oxide. As neither invention would harm the other, the two are compatible for a §103(a) combination. As previously cited, Ngo gives motivation in col. 1, lines 31-33. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Ngo's process with Perng's invention would have been beneficial because it facilitates producing a high quality, uniform and very thin PECVD oxide layer.

It is established that "the test for obviousness is not [an] express suggestion of the claimed invention in any or all of the references but rather what the references taken collectively would suggest to those of ordinary skill in the art." *In re Rosselet*, 146 USPQ 183, 186 (CCPA 1965). See also *In re Jones*, 21 USPQ2d 1941 (Fed. Cir. 1992); *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988). In this case, Ngo coats the walls with a PECVD oxide and then deposit a first PECVD oxide at a first rate, in combination with Perng, who deposits a first layer PECVD oxide and then a second layer of thermal CVD oxide at a lower rate.

For the above reasons, the §103(a) rejection is considered proper.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 703-305-5906. The examiner can normally be reached on Full Time.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3432 for regular communications and 703-305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

WB

June 10, 2003

  
Olik Chaudhuri  
Supervisory Patent Examiner  
Technology Center 2800